POVERTY ALLEVIATION AND SUSTAINABLE DEVELOPMENT

IMPLICATIONS FOR THE MANAGEMENT OF NATURAL CAPITAL

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1. INTRODUCTION

The purpose of this workshop is to see how the ideas of sustainable development fit into the vision for development articulated by Stiglitz in his Prebish lecture at UNCTAD in 1998. This is a challenge; Stiglitz barely mentions the term sustainable development in his entire lecture. Further he only twice refers (briefly) to the environment or natural capital, which are the specific issues to be covered in this paper! It is hard to imagine that these concepts were on his mind when he prepared the lecture.

In this paper, I will begin by looking at the literature on sustainable development, focus on the role of natural capital, and see what it implications it has for poverty alleviation. The next section will look at the ideas for economic development outlined by Stiglitz and see what one can draw out in terms of implications for sustainable development and natural capital management. The final section of the paper addresses the specific questions the organizers want answered, which relate to the Stiglitz paper and the guiding principles of sustainable development.

2. SUSTAINABLE DEVELOPMENT AND NATURAL CAPITAL

The term sustainable development has its origins in the IUCN 1980 World Conservation Strategy report, but it was with the World Commission on Environment and Development, entitled, 'Our Common Future (1987) that the term gained broad currency[2]. The Commission defined sustainable development as 'development that meets the needs for the present without compromising the ability of future generations to meet their own needs'. This definition, while useful in drawing attention to the concern with the long-term implications of present day development, asks as many questions as it answers. What constitutes 'needs', and how will these change over time? What reductions in the options available to future generations are acceptable and what are not? The operational aspects of sustainable development were not answered by the Brundtland Commission, although the Report itself gave strong hints that the environmental degradation resulting from today's economic policies that was a major source of concern from a sustainability viewpoint.

The first attempts to make the concept more precise were theoretical rather than practical. They focussed on the economic and the environmental dimensions of the debate. From the economic perspective, some of the earlier contributions (Pearce, Markandya and Barbier, 1990) suggested sustainable development should imply that **no generation** in the future would be worse of than the present generation. In other words society should not allow welfare to fall over time. Experience tells us that this does not always happen; countries experience growth and decline and their citizens welfare does indeed fall from time to time. In the last 170 years or so, some OECD countries have achieved a slow rate of economic growth of 1-2 percent *per capita per annum* measured in terms of Gross Domestic Product (Maddison, 1995). While this does not guarantee that welfare never fell from one year to another, or from one generation to another, it makes it more likely that future generations would, 'on average', be better off then the present one[3]. But these records have only been constructed, painstakingly, for a few advanced countries and we cannot judge others over such a long stretch. The best we can do is look at the last 33 years or so. Here the World Bank is an invaluable source. Out of

[2] This is more popularly known as the Brundtland Report, after the Chairman of the Commission.

[3] Ideally one should measure growth in consumption rather than income, but over very long periods the two should show similar trends. FOr a more demanding definition of sustainability in an intergenerational context see Markandya and Mason, 200.

148 countries in its database, GDP figures are available for 1965-1997 for 111 of them World Bank, 2000a). Of these 28 countries had negative *per capita growth* over the period. Half were in Africa (C.A.R., Chad, Congo, Cote D'Ivoire, Ghana, Madagascar, Mauritania, Mozambique, Niger, Senegal, Sierra Leone, Sudan, Togo, Zambia), one in Asia (Mongolia), three in the Middle East (Iran, Jordan, Kuwait, UAE), four in Eastern Europe (Bulgaria, Georgia, Romania) and six in Central and South America and the Caribbean (El Salvador, Haiti, Jamaica, Nicaragua, Peru, Venezuela). Furthermore, of the 37 countries for which we do not have data, it likely that many of them have had a decline in GDP – a number are newly created states of the Former Soviet Union, which have had precipitate declines in GDP).

Of course, *per capita* GDP is a very rough measure. Among its many failings, it does not tell us how particular groups in society fared over that time and especially the vulnerable and poor. In this regard one can say that if society as a whole is getting worse off then the poor will hardly ever better their position; being at the bottom of the pile their lot will almost certainly decline. The converse, too, which is less obvious, seems to hold to some extent. While not all groups will have improved their welfare in the 83 countries that have had positive economic growth in the last 33 years, most have, especially if the rate of growth has been high enough. The World Development Report for 2000 shows convincingly that several aggregate indicators of poverty decline as economic growth increases. The closer the growth rate is to zero, the more likely is it that poverty will not decline for all groups in society.

So far we have discussed sustainable development in relation to economic growth and said nothing about natural resources or natural capital[4]. The 'founding fathers' (and mothers) of sustainable development were equally concerned about both aspects, sustainability and development and on the former the worry was that society may be enjoying high and increasing welfare at the expense of running down its capital, particularly its natural capital.

To address this, economists have turned to looking at changes in the stock of wealth, where wealth is defined to include natural, human, physical and social capital (World Bank, 1997). If society's wealth *per capita* is declining then it is leaving future generations with less with which to sustain present levels of consumption. Unfortunately it is notoriously difficult to measure all these forms of capital for any one country and even more difficult to do so in a way that permits comparison across countries. Nevertheless some brave attempts have been made (World Bank 1997, Hamilton and Clemens, 1999 and Hamilton, 2000). The last and most recent of these has looked at changes in wealth *per capita* by looking at changes in genuine savings, for the period 1990 to 1997. The analysis shows a considerable increase in the number of countries with negative changes. With the exception of China, the majority of countries (47 of them) lying below median world income have declining wealth *per capita*. Of course, this is a short period, and it is dangerous to extrapolate it to the future. Non-zero population growth rates can easily yield alarming and nonsensical results if projected far enough into the future. There are also concerns that the measures of capital do not take enough account of the productivity of different types of capital. For example, the measures constructed by Hamilton include Australia as a country having negative wealth increase and the United States as on a 'knife edge' – under some parameters it too has an increase in wealth less than its increase in population. Give the stellar performance of the US economy during the period under consideration this result may be difficult to accept but it reflects the relatively low savings as well as the unusual increase in population. It does not account, however, for the technology changes that have increased productivity so sharply in the 1990s.

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[4] I will use the terms natural resources and natural capital interchangeably. Both provide a flow environmental services from assets that are available in some form without any anthropogenic involvement. Of course, their use depends on man as does their productivity.

Questions have also been raised as to the validity of constructing a single measure of wealth by adding up human, physical, natural and social forms of capital. Problems of converting some forms of capital into monetary units are well known. Some economists have raised concerns about the message that is being given if, say, natural capital is being depleted but physical capital accumulated so that total wealth is increasing (Daly, 1990). If the losses of natural capital are particularly critical to the functioning of the eco-system, and thereby to the economic systems that depend on them, their loss may be incalculable.

In summary, the literature on real wealth and sustainable development provides us with some early warnings about what may be go wrong if we do not look at the trends in all types of capital, including human and natural capital. But the data are for short periods and do not capture all aspects of economic development, notably the huge benefits from technological change. Hence they cannot point to unsustainability in a definitive way. Many of the factors that result in negative increases in *per capita* wealth can be reversed over the medium term, especially if the integrity of ecosystems is maintained and enough investment is taking place in human capital. In the very long term, of course, no one can ever say with any certainty what will happen.

3. POVERTY AND SUSTAINABILITY

What does the literature on sustainable development have to say about poverty? Directly it says little, but in the Bruntland definition, there is an implicit recognition of the issues of equity within and across generations. Intrageneration equity arises because we want to 'meet the needs of the present'. Any reasonable definition of such needs must include the elimination of 'pronounced deprivation in well-being', which is the World Bank's definition of poverty in its 2000 Development Report. Intergenerational equity refers to the needs of future generations and again no one would disagree with the view that this requires the elimination of poverty. One can ask why we should focus on poverty, rather than equity in a wider sense? No one has really provided a serious analysis of this but there are two possible reasons. One is that there is a clear point at which we can define **pronounced** deprivation as measured, say, in access to resources. The use of 'a dollar a day' serves this purpose and is based on some definition of what is needed to meet basic necessities. Although this has some superficial appeal, in my view the 'cut-off' remains arbitrary and one could argue, with some persuasion, that welfare increases gradually and continuously as consumption rises above the poverty line and falls gradually and continuously as consumption falls below it. The other, more likely reason is that politically it is much more appealing to talk about alleviating poverty rather than reducing inequality in a more general sense, even if the latter is a better guide to social welfare.

Whatever the reason, there is almost universal agreement that a focus on poverty is justified, even if, at times, the measures used are not particularly those of poverty but more general indicators of inequality or deprivation. Given this focus, we are interested in the linkages between poverty and natural capital. In this section I explore these linkages, drawing in particular on work by Ekbom and Boyo (1999), Duraippah (1996) and myself (Markandya, 2000). In doing so it is helpful to set out a number of propositions that are commonly made about these linkages and evaluate them.

3.1: AN INCREASE IN POVERTY RESULTS IN AN INCREASE IN DEGRADATION

It is popular among policy makers in the development field to claim that poverty leads to environmental degradation. There are a few studies that have documented a temporal association between increased poverty and increased environmental damage. De Janvry and Garcia (1988) have looked at a wide variety of experiences in Latin America. They state:

"Even if the masses of rural poor are not the major agents of environmental degradation, important environmental problems in many regions of Latin America are associated with their activities..."

Other authors note a similar association (Southgate, 1988, Mink, 1993, among others). A key issue of interest is, of course, the causality. Is it increasing poverty, caused by any one of a number of factors, that results in the degradation, or is it degradation, following natural disasters or policy-induced changes, that results in increased poverty? But even before one can address that there is a more basic question of fact. What correlation is there between **changes** in poverty and changes in the ambient environment? The literature does not pose the question in quite that way. In fact I could not find a single development-related study that had documented an increase in poverty and correlated it with a change in the ambient environment[5]. Given the central role such a hypothesis should have in this area, this is a surprising omission. Hence it cannot be said with any certainty that **increases in poverty are correlated with increases in degradation, let alone that they are the cause of the degradation.**

3.2 AN ENVIRONMENT INHABITED BY THE POOR WILL BE MORE DEGRADED THAN ONE INHABITED BY THE RICH

This thesis implies that, in a cross section of communities, the level of the ambient environment will be superior in a richer community than in a poorer community. Or, to be more precise, a poverty-affected community will have a more degraded environment than one that is not so affected. Some cross section studies addressing this issue exist. Jaganathan (1989) looked at rates of deforestation and the level of poverty in West Java and land use and poverty in Nigeria. He found little evidence that poverty was a driving force in the deforestation or in the damaging changes in land use. This study, however, looked (vaguely) at the **levels** of poverty against **changes** in the environment (rates of deforestation). More recently, Deninger and Mintzen (1996) have studies the relationship between forest cover and poverty in the Chiapas and Oaxaca regions of Mexico. They find, using probit regressions, that the higher the level of poverty in any region, the lower the probability of a plot of land being under forest cover. The results appear well determined but do not of course, establish causality. Nor do they establish that an increase in poverty will result in increased loss of forest cover.

At the farm level, two interesting papers that have addressed this question are Aheeyar (1998) and Linde-Rahr (1998). Aheeyar has looked at investment in soil conservation in Mahaweli region of Sri Lanka. Investment and annual expenditures on soil conservation were analysed for different income groups, both in cash terms as well as in terms of the imputed value of labour time. As expected, the lower income households spent less cash, but they made up for this to a large extent by higher levels of 'in-kind' expenditure on soil conservation, with the result that the aggregate level of annual expenditure on soil conservation did not show any significant relationship with the level of income. Nevertheless, the lack of cash expenditures was seen as a constraint on effective soil conservation, and an analysis of soil erosion and annual income did reveal a negative relationship between the two (again, however, without an implication of causality).

The study by Linde-Rahr looked that the farm-level determinants of reforestation in Vietnam. The factors which determine whether farmers plant trees as part of their land management activity has been looked at in a number of previous papers (Dewees, 1993, Patel *et al.*, 1995). However, the direct link to incomes and poverty has not been clearly established in them. Linde-Rahr's paper is particularly

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[5] One study that looks at a cross section of US data and correlates these two variables is Brooks and Sethi (1997). I consider those results in Section 6 below.

interesting in that it analyses the effects of income and gender on tree planting. He finds tree planting increases with the female number of household members and decreases with female income, but decreases with the male number of household members and increases with male income. The overall implications for poverty and tree planting are not evident, but the paper is suggestive of a rather complex relationship in which gender composition will be of some importance.

The above examples are all from rural areas. For the urban environment we may think we know the answer. The slums and poor neighbourhoods are surely the most environmentally degraded parts of the towns and cities. But even here, systematic studies are not obvious in their results. The recent work by Brooks and Sethi (1997) (B&S) and other US studies (Tietenberg, 1996) have looked at community exposure to pollution or polluting activities and correlated them with the levels of poverty (among other variables). B&S find that race and poverty are both important determinants of exposure. Poverty, however, had a 'quadratic effect', so that at very low levels of poverty the exposure was lower than average but at levels above a threshold it was positive[6]. Both Tietenberg and B&S note the significance of race, so that exposure goes up as the percentage of black people in the community increased, with no threshold effects.

No such studies are available for developing world. Were they to be undertaken, it would be interesting to know both what is the situation with respect to the urban environment and well as to the rural. Are the poorest communities the ones where the environment has been most degraded? They often have the more fragile land, but that does not mean that it is more damaged than land held by less poor people? As with much of the literature in this area, there are lots of theories but very serious empirical data.

3.3 Important social changes have resulted in concurrent increases in poverty and environmental degradation in a number of developing countries.

Social and economic changes that impinge on the poverty-environment link are divided into those that are directly policy-related (such as agricultural prices, tariffs, land tenure arrangements etc.) and those that are related to phenomena that are less directly a function of policy – population changes, changes in institutional arrangements etc. Lopez (1992) refers to the two as 'external' factors and 'internal' factors respectively. Although the distinction is not completely clear-cut, it is useful to divide these factors in this way.

External Factors

A popular line of reasoning among researchers begins by noting that a number of undesirable agriculture-related policies have been introduced in the recent past, especially in developing countries. The consequence of these has been to increase, through a variety of channels, the degradation that is caused by poor rural communities. Lopez (1992) blames the promotion of large-scale agriculture, export-oriented forestry and major public infrastructure as the main factors. Such policies result in a permanent change in the circumstances of the poor, making it more difficult for them to retain adequate land on a secure basis. Moreover, even if the policy is subsequently reversed, or the project or program arrested, the damage to the poor cannot be undone – there is a prevalence of hysterisis in environmental destruction. The mechanism is mainly a displacement of people to make way for the new projects or for expanded, more efficient, agriculture. The displaced often migrate to new areas, which are not suited to sustainable agriculture, and even to the extent that they could be used in a sustainably, the limited land rights do not encourage the migrants to use them in that way. Whether the poor are made poorer by

[6] Low exposure for very poor communities may be explained in terms of very low levels of economic activity in these areas.

this process remains unclear. But they certainly become more environmentally damaging in what they do.

Similar reasons are given by other scholars. De Janvry and Garcia (1988), in a review of rural poverty and environmental degradation in Latin America, were among the first to analyse issues clearly. The proximate causes of environmental degradation by the poor are:

- soil erosion by small holders as a rational strategy of survival;
- 'semi-proletarianization' of the rural population and a collapse of local institutions;
- deforestation as a result of migrants seeking land.

When asked why these developments have occurred, a number of answers are offered. Foremost among these is the claim that, in Central and South America at least, the governments pursued economic policies and strategies, which are unfavourable to agriculture. The main factor was the high level of taxation ('disprotection') of the sector. This lowered the return to land, making investment in soil conservation less attractive. At the same time, subsidies to inputs such as fertiliser and pesticides, which increased the attractiveness of agriculture, rarely reached small producers. Credit subsidies, for example, which were tied to mechanisation and livestock, did not help the poor. Furthermore, subsidies to mechanisation reduced employment possibilities in the sector. As a result, the agricultural sector has not fulfilled the employment creation potential of the sector.

Second has been the failure of institutions to respond to the changing demographic and technological changes. Land tenure has remained concentrated and the demise of the rental market has been damaging to small farmers. Security of tenure remains a major issue for many of the poor, making investment in conservation an unattractive option. The situation has been exacerbated by what the authors call an 'anti-peasant bias' in rural institutions. Subsidised institutional credit and new technological options are not easily accessible to small holders.

Local institutions have broken down because of the process of 'modernisation and the competitive pressures it entails'. It is unclear what this means, but the examples offered show that allocating time to the maintenance of common resources in rural communities is falling. This is partly because of the poor return to conservation in the changing circumstances, and partly because new institutions are needed to ensure that the benefits of any common action can indeed by captured by the community (on this see the discussion on institutional change, below).

More recently Heath and Binswanger (1996) have gone over the same ground and come up with similar conclusions. Looking in detail at Colombia, but drawing on wider experience in rural development, they focus on the presence of too many farmers working fragile land as the cause of both increased poverty and increased degradation. When asked why this is happening now, the reasons are similar to the above: the fact that modern agriculture absorbs too little labour, the subsidies for capital inputs discriminate against small farmers and the reduced scope for tenancy farming and sharecropping. The whole structure is exacerbated by the increase in the number of farmers, as the rural population increases.

The paper referred to above draw on the experience in South America. For Central America, similar considerations are believed to be valid[7]. Lopez and Scoeria (1996) discuss the poverty-environment

[7] Scholarly 'macro' level analysis of the links between policy, poverty and the environment do not appear to be available for other regions of the world.

linkages in Belize, where population growth and migration from other Central American countries have increased pressure on the forest resources. Although such use of land is not the largest cause of deforestation, it accounts for about one third of the loss of forest. Why is the level as high as it is? Partly it is the need for land to accommodate more farmers, and partly the fact that methods of cultivation are land intensive. Prices of crops such as corn and beans are more attractive than those of vegetables, which are more labour-intensive. If price incentives were different, land needs could be less and the damage associated with this sector correspondingly smaller.

Given the limited resources of small farmers, they need strong incentives if they are to practice sustainable agriculture[8]. The lack of secure rights to the land provides exactly the opposite; it encourages mining of the land and moving to new areas when the present plots are exhausted. In this context, however, the process of land privatisation has not benefited such farmers. It has a requirement that land be leased before purchase and the formula has resulted in higher prices per hectare for small plots than for large plots. Most have not been able to afford the acquisition of land through this scheme.

Internal Factors

Population Growth. Undoubtedly the most controversial of the internal factors is that of population growth. Many commentators point to the effects of increases in overall population in terms of pressure on land and increases in environmental degradation. (De Janvry and Garcia, 1988; Cleaver and Schreiber, 1994; Lopez, 1992; Lopez and Scoeria, 1996 all identify an increase in the population as a contributing factor in many situations). The literature does not, however, agree on the role of population. Opposing the views of the above authors, is the Boserup hypothesis (Boserup, 1965), which states that, as land becomes more scarce relative to labour, agriculture is intensified and productivity per unit area goes up. Rather than deteriorating, the land resource base improves in the process. Studies in Africa, such as Pingali *et al*, (1987), (Africa-wide) and Tiffen *et al* (1994) (Kenya, Machakos District) are cited as evidence that population growth can result in improved productivity.

The issue is complicated because the studies on the Boserup hypothesis do not isolate the effects of population growth from other factors that have given rise to the success stories. In the Machakos district, for example, Tiffen *et al* show how a situation in the 1930s, of low population and a colonial policy of restricting most of the land to white settlers was transformed into one where yields have increased ten fold, erosion has been arrested and the population has increased by a factor of six. The problem is to know how much of this was due to (a) the opening of land for all users, (b) investment in infrastructure, (c) access to non-farm employment opportunities, (d) technological developments that were brought in from outside the region (especially for maize) and (e) price incentives for products that were relatively environmentally benign. In other words, if the population growth had been half of what it is, would the changes in land use have been more or less environmentally beneficial?

Heath and Binswanger (1996) contrast the case of Kenya with that of Ethiopia, where areas with an increase in population density beyond 'carrying capacity' are also areas of the greatest degradation. They point out that how successfully the population growth is accommodated depends on the policy framework. In other words, with the right policies, a substantial increase in population need not result in environmental degradation.

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[8] Some economists have argued that the poor pay less attention to the environment because they have higher time preference (or discount) rates. The evidence for this, however, is not strong. Pender and Walker (1991) and Cuesta et al (1997) find generally high time preference rates among farmers, but not systematically higher ones for the poor. Furthermore, it should be noted that a high time preference rate does not necessarily imply a low level of investment in conservation.

Clearly the issue of population on the environment is more complex than some analysts might suggest. In many countries, especially in Africa and Asia, rural population growth is a major contributor to environmental pressure on the land and to environmental degradation. After allowing for migration to urban areas, the population in these regions is increasing, and the Boserup effect is not evident. Not all such regions have faced an environmental deterioration, however. The examples of Machakos and others indicate that, with the right strategies, the larger population can be accommodated. But even in these areas, a lower rate of population growth might have made for a better quality of life and less environmental pressures.

The evidence on the effects of population on the environment is further complicated by the fact that, as urban opportunities improve, some areas of land are becoming 'depopulated'. Young men in particular are migrating to the cities, leaving behind weakened families and less allocation of labour to collective soil conservation activities. This has been a particular problem in the Andes and in Mexico (Collins, 1987). A recent NAFTA-related study on the effects of a decline in the price of corn has suggested that even more migration from rural areas will result with increased environmental pressure (Nadal et al., 1998). To some extent a similar phenomenon occurred in Europe in the post war years, when land and buildings were simply abandoned as the occupants migrated to the towns and cities. But much of this patrimony is being revived through re-migration and as tourism and other uses of land are developed.

Where rural population growth is a matter of concern, what kind of polices can one introduce to reduce the population pressure? There is considerable evidence to suggest that education (particularly of women), the level of agricultural employment and level of nutrition and the extent of civil liberty all act to reduce the levels of total fertility (Sen, 1994, Dasgupta, 1995). Policies, therefore, that act to improve these factors can be expected to reduce total fertility and, thereby, pressure on the natural resource base. Some of these will also help reduce poverty. In addition, general economic growth has been negatively associated with population growth and it has been argued that the former will act to reduce population pressures over time. The problem with this argument, however, is that while *average* population growth rates may decline with *per capita* GDP, sections of the community that depend on natural resources may find themselves locked into a cycle of poverty in which high fertility rates are maintained and that, in turn, exacerbate the pressure on the natural environment.

Dasgupta (1995, 1996) has argued that this cycle could work in the following way. As common resource management systems break down, so individuals are more able and willing to make family size decisions that do not take full account of the social costs of child rearing, with the use of common resources treated as a free good. Over time, the natural resource base is increasingly depleted and the family unit requires more members to achieve the same level of welfare. Thus a cycle of increasing degradation is established. The theory has some plausibility but clearly needs to be tested with real data. Such studies still need to be carried out, both to test the validity of the theory and to see how it needs to be elaborated and developed further[9].

The Dynamics of Institutional Change. It was noted earlier that, at the heart of the environment-poverty relationship, is the question of what management systems operate for natural resources and how they evolve over time. This issue has been studied in depth by Lopez (1997), Narain (1998) and others. On the evolution of institutions, there are plausible theoretical and empirical studies, which show that, contrary to some commonly held views, there is frequently an inverse relationship between rural

[9] Dasgupta (1996) cites one study by Cleaver and Schreiber (1994), which produces positive correlations between poverty, fertility and environmental degradation in sub-Saharan Africa, and another by Filmer and Pritchett (1996) for Pakistan with similar results. But much more is needed to validate this view of how these factors are related.

communities' ability to co-operate in the management of common resources and the state of those resources. In other words an internal 'self-correcting' mechanism can exist, which implies that institutions evolve so as to respond to a deteriorating rural environment by **increasing** the level of co-operation over common resources. In a recent paper, Narain (1998) cites some evidence for this for common forest resources in the state of Gujarat in India. The key questions are (a) under what conditions is this mechanism likely to operate and (b) what can governments do facilitate this process of co-operation?

In a wide-ranging review Lopez identifies a number of factors that are critical for the appropriate institutional response to increasing environmental pressure. He begins by noting that neither privatisation nor elaborate traditional community regulations are sufficient to guarantee that the institutional changes will be sufficient to protect the natural resource base. Privatisation can be negative factor if it leads to a 'race for property rights', if it results in the creation of landless sub-group, and if the rights to previously communal land cannot be maintained when the land is left fallow. It can be a positive factor if it is carried out in a way that avoids these factors[10].

What other policies can one adopt to encourage the effective evolution of the institutions, and to slow down the social and environmental change that is damaging the natural resource base? Various proposals have been made. One is through ensuring and promoting homogeneity in the affected groups and, more generally reducing the costs of co-operation at the community level. Actions here include support through extension services, training, poverty alleviation etc. Education is also seen as an important influence, as is gender equality[11]. These will result in a 'new order' but one that is more sensitive to the environmental constraints and the imperative of co-operation in the management of natural resources. Another is information and public education in general. A third is legal and other government support for new and reformed property management systems. All these responses are of great importance in setting the right policy framework. Unfortunately the state of knowledge about the dynamics of institutional change, on which to base them, remains weak.

There are examples where the evolution has taken place successfully in the face of increasing pressure on the resource base. One study from Nigeria (Mortimore, 1989) shows how small farmers adopted sustainable management strategies on new land even when the short term costs of doing so were high. Another is the Kenya study referred to above (Tiffen et al, 1994). It was partly the effective transformation of institutions that was responsible for the success of that case. Other examples of 'success' in institutional evolution have come from India. Taking data from Western India, Chopra and Gulati (1996) have shown that property rights have evolved in such a way so as to reduce out-migration and improve the management of common resources. Similarly, Chopra and Kadekodi (1988) show how the transference of property rights from the state to village communities and from individual to 'pooled community management' has generated benefits in terms of the management of the resource base in selected Indian cases.

These are interesting and important papers, but more work needs to be done to understand the dynamics of institutional change for agricultural communities in developing countries. There is no doubt that, with the onset of major social and political changes in the post-war period many of the systems of traditional management have broken down. If this is to be reversed a better understanding of the dynamics, and the role of environmental policy is essential.

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[10] In some cases government action has been actually harmful to the effective evolution of the institutions. A case in point is the nationalisation of formerly traditionally managed resources, with disastrous consequences. (Bromley, 1991).

[11] In this context the book by Agarwal (1994) makes a strong case for the role of womens' empowerment as a factor in arresting natural resource degradation.

3.3 A DETERIORATION OF THE AMBIENT ENVIRONMENT HURTS THE POOR MORE THAN THE RICH (AND CONVERSELY).

The general presumption among policy makers is that a declining natural environment hurts the poorest sections of society. By and large this is found to be so. The vulnerable are often the users of marginal resources and also the most dependent on the common resources of the community in which they live (Dasgupta, 1993, 1996). Hence it is these groups that are most impacted when the deforestation, soil erosion and other negative impacts on the environment occur, often as a result of natural disasters. This common view is largely correct, but *detailed quantitative empirical evidence* on how the poor are affected relative to the non-poor, and which groups are especially vulnerable is not easy to find. There are some exceptions. Fuelwood scarcity has been shown to impose a greater cost on the poor than on the better-off (e.g. the time spent collecting fuelwood has a high value relative to other components of the household's income) (Kumar and Hotchkiss, 1988). Research by Kadekodi (1995) has shown that, when water shortages occur as a result of misuse or natural events, it is the poor who are the most affected. However, one cannot conclude that environmental degradation always hurts the poor more than the better off. For urban pollution problems, for example, such as outdoor air quality, the poor are more likely to live closer to highly polluted areas, but the value they place on cleaner air is less than that of the rich. Hence a general deterioration in air quality may hurt more poor people, but each has a lower value of the benefit, implying that the change in their position vis-à-vis the better off is ambiguous. This is examined further in the next section.

3.4 POLICIES THAT CHANGE THE ENVIRONMENT CAN HURT THE POOR MORE THAN THE RICH (OR VICE VERSA).

When measures are taken to improve a degraded environment, how are the poor affected? It depends, of course, on what the measures are. Environmental regulations that increase the costs of producing certain goods can result in increased unemployment and higher prices for the goods. How they impact on the poor will depend on what the goods are, what share they have in the budget of the poor, and who suffers the unemployment..

One of the more sophisticated attempts to see how changes in the quality of the environment have actually affected the poor versus the rich is the paper by Brooks and Sethi (1997). Using the same data referred in Section 2, they also look at how the changes in toxic release inventory between the date of the release of the first data set and the second (1990 and 1992 respectively) were distributed across US zip codes. Using a logit equation in which a value of one implied an increase in the level and a zero implied a decrease or no change, they found that jurisdiction poverty was negatively related to increases in toxic releases. The same applied to the presence of collective action and the level of voter turnout. On the other hand, a one percent increase in the percentage of blacks increased the probability of a worsened release situation by 0.002. The negative sign on poverty is 'explained' in terms of lower levels of activity in poor areas. It does suggest, however, that the poor do not always fare worse as the environment changes over time. Unfortunately no such data are available for developing countries.

There are a few recent studies on the distributional impacts of environmental regulations in developing countries. Eskeland and Devarajan (1996), looked at the distribution of environmental costs for the transport sector in Indonesia and Mexico. They conclude from the data that, as expenditure on private and public transport increases as a percentage of income across quintiles, measures to reduce emissions from transport (particularly private transport) will have a progressive impact.

This has been followed by a more detailed analysis of two regions of Indonesia (Jakarta and the 'Rest of Java') by Eskeland and Kong (1998). The authors develop a measure of the 'distributional characteristics' of a policy. This is an income-weighted measure of the increase in costs for different

income groups resulting from measures that increase pollution control costs, or a similar measure of the increase in benefits resulting from the improved environment that results from the same measures. Environmental regulations in the areas of energy production and use, and transport are analysed in some detail. On the distributional effects of control costs the paper shows that transport policies are more 'distribution friendly' than energy policies, mainly because transport environmental controls affect the rich relatively more than do energy environmental controls. Within transport, controls on private transport have a relatively smaller impact on the lower income groups than do controls on public transport. Within energy, gas and electricity controls have the smallest impacts on the poor, and firewood, kerosene and coal have the biggest. All these differences become much smaller, however, when the indirect effects of the control measures are taken into account – i.e. when the impacts of the measures on the production costs of other commodities are allowed for.

On the benefits side the analysis is complicated by the fact that one does not know with any accuracy how the willingness to pay for the improvements changes with income. Eskeland and Kong take a range of values for the 'income elasticity of willingness to pay for environmental improvements' they estimate the distributional effects of the benefits[12]. These are roughly the same for the energy and transport regulations. With an income elasticity of demand for the benefits of one (a commonly assumed value) the resulting net distributional effects (taking both costs and benefits) are approximately neutral for energy and positive for transport. The lower the income elasticity of demand for the benefits, the greater are the distributional impacts of the benefits, and the greater the net benefits from both strategies.

Another study for Indonesia that has looked at the income impacts of environmental policies in a computable general equilibrium framework is that of Resosudarmo and Thorbecke (1996). They analyse the 'Blue Sky Program (BSP)' that includes a number of measures to improve air quality -- such as reductions in leaded gasoline, recovery of vapour emissions, higher emissions standards for vehicles etc. Using a Social Accounting Matrix, to which pollution and health impacts sectors have been added, they show that the distributional outcome depends on what is assumed about reductions in output in the controlled sectors. With no change in output, there are negligible losses of incomes. With a fall in output, however, in the transportation sector, some low-income households could be worse off to the extent of 3 to 4 per cent. The model has a number of limitations, but the results are useful in picking out certain occupational groups and tracing through the effects of different polices on them. Such a sophisticated analysis is needed if we are to say something about the output effects of these policies elsewhere.

These results are not inconsistent with those from industrialised OECD countries, although there are some differences. The OECD experience is well-covered in recent publications (OECD, 1994 and Tietenberg, 1996). Studies on air pollution distinguish between mobile and stationary sources. Control costs for mobile source pollution through vehicles tend to be regressively distributed (Harrison, 1975, 1977) in the US. The difference between the US and Indonesia and Mexico can be explained by the fact that rural car ownership is much lower in the latter two countries[13]. For stationary sources the distribution of costs is more complex to model because the incidence structure is more involved, but in essence the US studies

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[12] They take a range of values from 0.1 to 2. A default value of one is often used and very crude income elasticity of the WTP for health benefits of 0.35 estimate has been suggested by Krupnick et al, 1996, based on Mitchell and Carson, 1986. But this *seriously* needs to be confirmed.

[13] The US regressivity can be reduced by suitable changes in policy design. Harrison suggested, for example, that lower standards be adopted in rural areas than in urban ones. This results in a significant reduction in regressivity because car ownership among poor households is much higher in rural areas than urban ones.

show some regressivity of costs (Gianessi et al., 1979). The research issue here is the adoption of more sophisticated models to study the incidence effects of such measures, especially when they are adopted across a wide range of industries and result in a number of relative price changes. For water pollution Gianessi et al. (1979) also found costs to be regressively distributed, in spite of the fact that part of the costs were borne by general subsidies, which come from the local/regional tax system and which are therefore (probably) mildly progressive.

On the benefits side crude estimates suggest that mobile air pollution benefits are progressive for those living in urban areas. The same does not apply, however, in suburban areas or in rural communities. Tietenberg, 1996 cites some work by Asch and Seneca, who examined socio-economic data from stationary sources in three US cities and concluded that the benefits were greatest (in terms of reductions in air pollution) in the poorest areas of those cities. In the case of water regulation, however, benefits more clearly favour the better-off more than the poor, although the number of studies are very few. Harrison (1981) found the benefits of the 1972 Water Pollution Control Act in the US to be concentrated among middle income groups relative to the poor.

Market based instruments such as taxes and permits have also been assessed for their distributional effects. Many of the studies look at instruments that have not actually be implemented; they are based on simulation results rather than historic empirical data and need to be viewed in that light. Smith, 1995, has looked at the distributional effects of 'Green Taxes' in Britain and Germany and analysed the impacts of a carbon tax across income groups. As expected the tax would be mildly regressive, more so in Britain than Germany. Taxes on petrol on the other hand are mildly progressive.

Comparisons between the distributional effects of taxes and of command and control instruments are not generally available for developing countries. Some work by the OECD (OECD, 1994), has looked at trading programs for emissions and compared them (implicitly) to those of direct controls. Tradable permit schemes are generally more efficient in achieving environmental goals than command and control schemes and hence entail a smaller increase in prices. Since such price increases were found to be regressive in their impact, the smaller they are the less the regressive impact. Furthermore, most actual schemes do not involve selling the initial allocation of permits to existing polluters but providing them free of charge. This in turn can reduce the burden on industry, compared to a tax, which is not rebated. Thus the simulation analysis carried out on US schemes have shown a net benefit to low income households in using marketable permits compared to conventional command and control instruments. It should be noted, however, that the focus of studies of marketable permit schemes is not the distributive impacts on households, but rather the regional and industrial distributive effects.

A significant problem in environmental regulation in developing countries arises from difficulties in controlling small scale enterprises (SSEs), because of their limited financial and human resources, and low-level of technology. Regulators frequently shy away from such regulations, from fear of the effects these may have on employment and incomes of poor households. Studies of the distributional effects of the regulation of SSEs, however, are very few. One recent attempt is Lanjouw (1997), who has analysed this sector in Ecuador. Overall, employment in the pollution-intensive SSEs is not concentrated among the poor, but among the urban, literate population. Hence to the extent that environmental regulations in the sector impact on employment, they do not impact on the poorest. Furthermore, estimates of the impacts of large-scale losses of employment in this sector on poverty are not large. Overall he concludes that arguments against regulation the SSEs on the grounds of increases poverty are exaggerated.

Finally there are distributive effects in developing countries arising from the regulations in developed countries. These occur through changes in the direction and composition of trade. Although there are some studies that look at the effects of environmental regulations on trade, there is little work on

how the these changes in trade patterns impact on the distribution of income in the developing countries. The study by Verbruggen et al. 1995, shows, for example, how environmental export regulations in the EU have impacted on the exports of cut flowers from Kenya, and hence had a detrimental effect on the incomes of poor Kenyan farmers. A set of case studies on trade and the environment (Jha et al, 1998) also conclude that stricter environmental regulations in developed countries are having a bigger impact on the small and middle sized enterprises in developing countries, with a *prima facie* case that perhaps the less well-off are more impacted than the rich. But this has not been systematically studied from the income distribution point of view.

3.5 ECONOMIC DEVELOPMENT SHOULD HELP REDUCE POVERTY AND IMPROVE THE ENVIRONMENT.

There is a strand of literature (Grossman and Krueger, 1991, World Bank, 1992, Barbier, 1997), which suggests that the relationship between GDP and the quality of the environment is 'U-shaped' – i.e. the quality of the environment deteriorates initially as GDP *per capita* increases, and then improves after a certain critical value of *per capita* GDP has been reached. This critical value varies with the pollutant, and indeed for some pollutants such as VOCs there is no 'turning point'. In fact the evidence for such a relationship is mixed with some studies even showing an inverted 'U' curve (Stern et al, 1996).

This model (also referred to as the 'Environmental Kuznets Curve') can be looked at in conjunction with the original Kuznets curve, which postulated a deterioration in income distribution in the early stages of economic growth, followed by an improvement later. Taking the two together one would conclude that a declining environmental quality and increasing income inequality go hand in hand as part of the 'development process'. In the end things should work out fine, with improvements in both these indicators of human welfare.

Unfortunately, such a sanguine view is inappropriate and misleading from a policy viewpoint. First, some of the environmental degradation being observed, and sometimes being caused by extreme poverty, is irreversible and will never be recovered. Second, what is a long term time series relationship is being inferred from cross section inter-country data. There is no reason why a particular country should follow the path characterised by a cross section of countries. Indeed the aim should be to follow a policy based on a comparison of domestic costs and benefits of different options, taking account of their impacts on all aspects of welfare, including poverty/inequality, environmental quality, GDP and other indicators such as those used by the UNDP in its Human Development Reports. Although the Kuznets curve is a useful empirical regularity, its existence is of little relevance in determining such a set of policies.

3.6 POVERTY AND SUSTAINABLE DEVELOPMENT: SOME CONCLUSIONS.

Thus far the discussion has been on poverty and its linkages with sustainable development, especially through the maintenance of natural capital. We have noted first that indicators of sustainable development have to take account of all types of assets, including natural, human and social capital as well physical capital. It is the sum total of these different forms that has to be non-decreasing if development is to be judged as sustainable. Second we observe that societies that maintain, or increase, the level of output as measured by GDP are also societies that reduce the levels of poverty. From these two observations it is not unreasonable to conclude that development will be consistent with the long term elimination of poverty if it is carried out in a way that ensures an adequate intergenerational transfer of all forms of capital, including natural capital. The latter is particularly important in areas where it is uneasily substituted for by other forms, such as human or physical capital.

More specifically, we have noted that there are linkages between what happens to the stock of natural capital and poverty. These are not simple, and some of the more commonly held views are not proven. In

particular, the poor are not necessarily more damaging to their environment than the better off. Nor is there any support for the view that an increase in poverty always causes an increase in environmental degradation.

There is, however, support for the proposition that when changes in institutions take place, which break down common management systems for natural resources, these can result in increased poverty and increased degradation of the environment. Much depends on how society copes with the changes and how capable it is in adapting its institutions to such changes. There are 'success stories' as well as cases of failure. We need to better understand this process of adaptation, and in this I believe there are some common grounds with the strategy for development that Stiglitz proposes.

There is also a lot of casual evidence to indicate that when there is a loss of natural capital, perhaps as a result of natural disasters, the poor suffer disproportionately more than the rich. Hence policies that prevent such losses, particularly in relation to fuelwood, water and soil, will benefit the poor, **as long as the costs of such policies do not fall heavily on them**. In general we cannot say that preservation of natural capital, or an improvement of the environment is a 'pro-poor' policy. It does depend on how the costs are distributed. Some work has been carried out to identify the kinds of measures that are pro-poor and those that are not but more can and should be done in this regard.

4. POVERTY, SUSTAINABILITY AND STIGLITZ'S STRATEGY FOR DEVELOPMENT

Let us now turn to the vision for development that Stiglitz articulated in his Prebisch lecture. From a wide ranging review of development strategies over the last 50 years, he derives a number of recommendations. Perhaps the most important idea is that we need to pay more attention to culture and institutional development, with a focus on the individual, the family and the community, in addition, of course, to the public and private sectors of the economy. As technological and economic changes unfold, they have impacts on the different stakeholders. It is imperative that these groups have a say in the way in which society responds to these changes; **ownership** and **participation**, **inclusion** and **consensus**, and **social capital** are the key words. This is a departure from the more conventional economic views of development, which have focussed on the roles of the public and private sector and efficiency in the allocation of resources, and have had little to say on these topics.

Of course it would wrong to assume that Stiglitz ignores these more conventional issues in development. He has makes a number of key recommendations here too, in some cases, departing from the pure neoclassical orthodoxy. Briefly these are:

- The creation of a strong, competitive, stable and efficient private sector through a sound legal and regulatory environment.
- A stable macroeconomic framework that 'reduces the country's vulnerability to the inevitable shocks that are associated with global engagement'. In this regard he notes the possibly destructive impacts of short term international capital flows.
- Public provision of health, infrastructure and education services, and/or the creation of an enabling environment so that the private sector can provide some of these services.
- Openness to trade and a liberalization of international trade in goods and services with, at the same time, increased opening of developed country markets to developing country exports and a more generous approach to sharing intellectual property rights on the part of the developed countries.

Finally, he includes a brief statement to the effect that global environmental goods, such a greenhouse gases, which are in danger of being over produced or over used, need to be addressed collectively.

While Stiglitz does not have much to say about sustainable development and poverty, his vision does have some implications for sustainability. Principally, he sees these measures as leading to a social transformation that will be 'sustainable, strengthening the environment' and 'durable, withstanding the vicissitudes sometimes accompanying democratic processes'. On poverty he is more specific. He believes that his measures will reduce poverty and hopefully, eliminate it at least in terms of the absolute standard.

I would not question the general thrust of that claim, but the paper does not say **how** these goals will be achieved. Let me offer some suggestions as to (a) how his recommendations lead to these goals and (b) what complementary measures need be introduced that will make the claim more likely to be realised.

4.1 THE DIRECT IMPLICATIONS OF STIGLITZ'S RECOMMENDATIONS FOR SUSTAINABLILITY AND POVERTY.

Directly, the strategy he proposes is necessary if sustained growth is to be achieved. From historical experience this will contribute to the alleviation of poverty more than any other single measure. At the same time, the policies of openness, consensus and transparency should ensure that particular policies and programmes are not implemented if they have serious adverse implications for particular groups in society.

The focus on institutions is also important for the poverty/environment linkages discussed in the previous section. As we noted there, a key dimension of the response of communities to social, economic and environmental pressures is the institutional dynamic. Where this works well, the effects are positive, or at least not as damaging as they might be. Where it does not work well, the effects can be disastrous. While we do not know all the secrets of what makes for good institutional dynamics, we can say with some confidence that relations of trust, participation of all stakeholders in decision-making and a sense of ownership by all in the wider social fabric are critical.

On the environmental issues specifically, Stiglitz has only a brief paragraph, to the effect that the global community needs to address the issue of global environmental resources. No one would argue against this but it hardly offers any advice as to how this is to be done. Since there is a huge literature on this important subject, one can admonish the author for giving it such short shrift.

4.2 ADDITIONAL MEASURES NEEDED IF STIGLITZ'S VISION FOR DEVELOPMENT IS TOBE CONSISTENT WITH SUSTAINABLE DEVELOPMENT.

The vision for development that Stiglitz provides is just that – a vision. It does not contain detailed operational guidance on how to achieve the goals he seeks. While the full exercise of working out the operational significance of his strategy is beyond the scope of this paper, issues relating to poverty and natural resource management are discussed further below. The principle actions that need to be taken are the following.

Tracking Progress Toward Sustainable Development. It is imperative for policy makers to know how consistent their actions are with the goals of sustainable development. This can only be achieved by having indicators that are regularly reported and widely disseminated. As far as natural capital is concerned, some of the wealth measures discussed in Section 2 are useful and should be constructed, using consistent methods of valuing all assets including natural resource stock changes. Work is still in progress on this and more effort is needed if we are to have measures that can be used with the same level of confidence as, say, GDP.

But a real wealth measure is not enough. Tracking sustainable development needs physical measures for ecosystem health and warning indicators when that health is under threat. Much work has been done on such pressure indicators (Adrinasee, 19xx, Markandya and Dale, 2001) and we have a good idea of what information countries need. But what has not yet been done is to develop those indicators that both track the state of ecosystems and at the same time take account of the impacts of these changes on vulnerable individuals and communities. Some changes to the state of natural capital are more threatening in this respect than others. It would be useful to have an indication of the extent to which this is so.

Guidelines for Evaluating Policies and Programmes with Respect to Natural Capital and Poverty. Many important decisions regarding economic development are taken without paying enough attention to their implications for indicators of poverty or the state of the natural environment. Although this is changing, the capacity of developing countries to undertake such assessment is limited. Furthermore, integrated systems of assessment that look at **both** environment and poverty issues are very rare. It is true that development agencies have devoted considerable resources to ensuring major environmentally sensitive investment programmes are scrutinised over their environmental impacts and (increasingly) their social impacts. But it is not only such programmes that have implications for poverty and natural capital. So do policies in the areas of trade liberalization, structural adjustment and privatisation; perhaps even more so. We need to develop tools of analysis that are simple and robust and that track such policies in terms of their impacts on indicators of sustainability and poverty. Furthermore such analysis should feedback into the design of the policies. We are a long way from achieving these goals.

In the design of policy the tendency has been to look for 'win-win' solutions. This is natural – policy makers want to please all parties and avoid having to make hard choices. But we cannot hope to cover all relevant options in this way. There are simply too many situations where there are trade-offs. For example a conservation programme may improve the stock of environmental capital but at a cost in terms of increased hardship to some; or a trade liberalization or privatization measure may promote economic growth but at a cost in terms of some environmental damage and/or increased unemployment. The traditional methods of analysis of such trade-offs have been social benefit-cost and multi-criteria analysis . They should continue to be used but they need to be strengthened, especially in the way that poverty and natural resource impacts are assessed, both in terms of changes in their present and future levels. As this work evolves, we should get some broad guidance of how environmental policies can be made 'pro-poor', how what poverty reduction strategies can be made 'pro-environment' and how macroeconomic policies can be made more sensitive to both sets of concerns.

International Environmental Issues. Sustainable development certainly requires us to address the global environmental challenges of climate change, protection of the stratospheric ozone layer and conservation of biodiversity. It also requires a concerted approach to transboundary environmental problems relating to air pollution, management of international waters and the like. The difficulties in these areas are clear. Countries have to cooperate but they cannot be made to do so. An agreement has to be acceptable to all parties but each party will perceive the costs and benefits differently. Thus far, in spite the many difficulties I would take an optimistic view of cooperation in this area. Countries have managed to address some issues effectively (e.g. reducing the use of ozone depleting substances through the Montreal Protocol, regional agreements on reducing transboundary air emissions) and are making slow progress on others, such as reductions in greenhouse gases.

The poverty dimension in such deliberations has had a relatively small role but here, too, countries are beginning to evaluate options with respect to their social implications, including several that impinge on poverty. For example work on the Clean Development Mechanism (which permits reductions in greenhouse gases in a developing countries to be credited to a developed country in exchange for support in making the reductions) is developing guidelines for assessing projects, taking account of the

broader social and poverty impacts (Markandya, 1998). This kind of assessment can and should be extended to other international environmental problems.

In summary, much of what is needed is to **mainstream** poverty and environmental issues in day-to-day economic decision-making; to include poverty issues in environmental policy-making and vice-versa. If these measures are taken, and of the reforms in economic management that Stiglitz espouses are carried out, I believe we will move substantially in the right directions.

5. CONCLUSIONS AND RECOMMENDATIONS

To be written after the workshop.

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